Comments on
Screening Level Recontamination Analysis for Stormwater Basins L and M at Terminal 4
Dated April 25, 2012

Submitted: May 22, 2012

Following are EPA's comments on the April 25, 2012 "*Screening Level Recontamination Analysis for Stormwater Basins L and M at Terminal 4"* prepared by Formation Environmental (Formation) on behalf of the Port of Portland.

General Comments:

1. EPA's comments on the April 25, 2012 submittal consider the extent to which this report follows the "*Final Sediment Recontamination Analysis Approach*" document (prepared by Formation, dated August 12, 2010). EPA has provided previous comments on the September 28, 2011 "*Storm Water Source Control Completion Report: Terminal 4 Slip 1 and Slip 3 Upland Facilities"* (prepared by Ash Creek Associates, Inc. on behalf of the Port of Portland) noting serious concerns with the adequacy and representativeness of the water quality monitoring/hydraulic data related to the performance of the storm water treatment systems at Terminal 4 (T4). The proposed recontamination analysis is predicated on a regression analysis of monitoring data from as few as four storm events. This is an insufficient number of storm event samples (n=4) to conclusively confirm the mean and range of the contaminants of concern (COCs) in runoff. Moreover, the sampling method, which relied on a single grab sample collected during the first three hours of an event, does not provide representative storm event concentrations, which is noted in the April 2012 report.

2. EPA has also noted concerns with SEDCAM in our review of the September 2011 document. SEDCAM is the screening level modeling tool that is applied for the recontamination analysis. SEDCAM is a simple steady-state model which is being used to estimate contaminant of interest (COI) concentrations in an assumed layer of surface sediments over a 30-year period. A "steady state" model considers a single set of environmental conditions which are assumed to be constant for the entire period (e.g., sedimentation rates, storm water runoff, upstream river water quality, runoff water quality). These highly dynamic processes are all assumed to be constant for the 30-year period of analysis. Moreover SEDCAM recontamination analysis presented in the April 2012 report is based on average conditions (e.g., hydrology, meteorology for a 30-year period). While it is not uncommon to apply steady-state modeling tools for permitting or other regulatory processes, they are typically applied to "critical" or "design" conditions (i.e., worst-case or near worst-case). The proposed recontamination analysis does apply "conservative" assumptions and presents a sensitivity analysis but it does not go far enough in developing a useful consistent approach that could be applied as a screening level line-of-evidence to predict recontamination potential at T4.

EPA and Oregon Department of Environmental Quality (DEQ) are continuing to work on developing a consistent approach to recontamination evaluation processes so we will not be able to convey "agency approved" parameters or assumptions as part of these comments.

Specific Comments:

1. Page 3, Section 1.2, last paragraph: The report states incorrectly that EPA has approved a recontamination analysis approach as part of a Removal Action process.

2. Page 8, Section 3.1, overall approach: The report should state the limitations of the screening level recontamination analysis approach including the following:

    a) It only addresses the storm water pathway and does not include groundwater, bank erosion, etc.
    b) It does not include dissolved and colloidal portions of storm water, groundwater, and other discharges.
    c) Sources of uncertainty in the approach and steps included in the analysis to address uncertainty.

3. Page 8, Section 3.2, SEDCAM Recontamination Model for River Sediment Subareas: The report states that, "*Based on the level of detail of available data, a more complex model is not expected to produce more accurate results.*" The level of detail of the existing data should be described in the context of the uncertainties introduced into the analysis. The SEDCAM model description should clearly describe that SEDCAM is a screening level tool and discuss what that implies relative to the model predictions. Based on a preliminary literature search, prior SEDCAM applications have not been subjected to peer-reviews relative to other similar modeling tools. The SEDCAM application in this report does not provide typical calibration/ verification results typical of other modeling tools.

4. Page 10, Section 3.3, Stormwater Data Analysis, 2nd paragraph: The method for "normalization" of COI concentrations by linear regression with total suspended sediment is not adequately described and the results should be verified either using existing data, which may not be adequate, or by acquiring additional data. The following comments are provided:

    a) Small sample sizes: Since the regressions are based on relatively few data points (e.g., $\leq$7), 95% confidence intervals should be presented.
    b) Non-normal distribution: Storm water quality data are typically skewed and non-normally distributed. This is evident in the regressions shown in Figures 3-10 through 3-12. The data should be subjected to "normality" statistical tests and, if necessary, analyzed using lognormal transformation.
    c) Particle Size: The normalization approach does not consider the particle size. Generally higher concentrations of polycyclic aromatic hydrocarbons (PAHs) would be expected in finer particles which have large surface areas per unit weight. This is likely beyond the scope of the screening-level analysis, but could be very important in defining recontamination potential.

5. Page 11, Section 3.3.1, Screening of PAH Data: The report states that, "*Four compounds were measured at maximum concentrations over two hundred times the JSCS screening level in Basin L in storm water prior to the storm water line cleanouts*." The exceedance calculation should be added to Table 3-1 and the parameters highlighted. The "*Final Sediment Recontamination Analysis Approach*" (dated August 12, 2010) also included cadmium, lead, total polychlorinated biphenyls (PCBs), and several additional PAHs (i.e., benzo(a)anthracene, dibenzo(a,h)anthracene, and pyrene). An explanation as to why these other COIs were dropped from the analysis should be provided.

6. Page 18, Section 3.3.2.2, Basin M, 1st paragraph: The report states, "*Samples collected in 2010 and 2011 were collected near the start of the storms when treatment would be expected to have the maximum effectiveness in removing suspended solids*." This statement strongly implies that the post-cleanout sampling data are not representative of the performance of the treatment system, rather that it overstates the effectiveness of the source control measures (SCMs).

7. Page 18, Section 3.3.2.2, Basin M, 1st paragraph: The report states, "*The 2007 sampling consisted of composite sampling covering greater periods of the storm, where the treatment system could have lesser cumulative effect (i.e., sampling includes the period after its flow capacity was exceeded).*" This statement re-affirms EPA's concerns expressed in previous comments on the "*Storm Water Source Control Completion Report*" (dated September 28, 2011), regarding the adequacy and representativeness of the monitoring data. The regression analysis for Basin M is based on only four (4) data points and appears to correlate to a single high storm event concentration.

8. Page 25, Section 3.4, Sedimentation Rate: The report cites deposition rates based on bathymetric surveys as presented in the "*Final Sediment Recontamination Analysis Approach*" (dated August 12, 2010). The 2010 report noted that, "*significant uncertainty exists, especially since the net sedimentation rates are within the margin of survey error (+/- 7.62 cm)*" (page 41). An analysis of this uncertainty should be included in the recontamination analysis. Since these assumptions are critical to the recontamination analysis, SEDCAM sensitivity runs should include an analysis which considers very low net mass gain of sediment, especially for Wheeler Bay since the assumed sedimentation rate (0.6 cm/year) is an order of magnitude lower than the reported bathymetric survey margin of error (7.62 cm).

9. Page 26, Section 3.4, Sedimentation Rate, Table 3-9: The derivation of sedimentation rates (cm/yr) from mean differences (cm) should be explained in more detail. The mean difference between Winter 2001/2 and Winter 2008/9 is eight years but the ratio of Toe of Slip 1 is 7.92 (19.8 divided by 2.5) while Wheeler Bay is 8.66 (5.2 divided by 0.6). The basis for calculating the annual sedimentation rate (cm/yr) should be provided.

10. Page 26, Section 3.4, Sedimentation Rate: The basis for the estimated sediment density assumption of 1.53 grams per cubic centimeter (g/cc) should be explained in more detail. The rational of how and why the assumed sediment density derived from the harborwide RI/FS is representative of conditions in Wheeler Bay should be provided.

11. Page 27, Section 3.5, Sedimentation Mass Balance, Table 3-12: The report assumes that 75% of Outfall L storm water solids discharges deposit in Wheeler Bay (25% Cap area and 50% MNR area) and 25% of Outfall M storm water solids discharges deposit in the Toe of Slip 1 MNR area. The description of these estimates is that it is, "B*ased on physical layout (storm water outfall locations, subarea configuration, etc.)…*" The report should provide an analytical basis for how for these assumptions were derived. Since the assumptions of storm water deposition are critical to the recontamination analysis, SEDCAM sensitivity runs should include an analysis which considers 100% of outfall storm water solids discharges depositing in the subarea.

12. Page 28, Section 3.6, COI Concentration on Upland Sediment, 1st paragraph: The report notes that uncertainty results from proximity of the sediment traps intended to represent upstream COI concentrations to stormwater outfalls discharging from Basin D. The location of the Toyota Dolphin in-river sediment trap is in very close proximity to storm water outfalls and does not appear to represent upstream sediment sources. The "*Final Sediment Recontamination Analysis Approach*" (dated August 12, 2010) also notes that data from the mid-Willamette sediment trap located in the center of the river channel may not represent, "*the type of sediment being deposited in the Removal Action Area"*. The report also questions the potential impacts of wet versus dry weather conditions on the COI concentration during the data collection period. These uncertainties should be discussed and included in the analysis.

13. Page 28, Section 3.6, COI Concentration on Upland Sediment, Tables 3-14 and 3-15: The report states that the data from these tables was combined and averaged. These averaging results should be presented in an additional table showing the averages.

14. Page 29: There is no reference to Table 3-16 in the text.

15. Page 33-35, Section 4.1, Model Inputs, Table 4-1, 4-2, and 4.3: These tables include model results which should be presented in Section 4.2. These tables should include an applicable Screening Level Value for comparison with the predicted contaminant of potential concern (COPC) concentration. The presentation of the 'Sedimentation Rate (kg/yr)' column in these tables is repetitive and distracting.

16. Page 35, Section 4.2, SEDCAM Modeling Results: A graphical presentation of results is preferred. Currently modeling results are embedded in Tables 4-1 through 4-3 and Appendix B.

17. Page 36, Section 4.2, SEDCAM Modeling Results, 2nd bullet: The Wheeler Bay PAHs recontamination results require additional discussion and analysis. The report should provide a basis for the statement that the Wheeler Bay Cap area analysis is conservative because, "*the PRG applies to half-mile stretches of the river and the Wheeler Bay Cap subarea is much smaller."* This statement suggests that the potential size of the recontamination area should be a factor in considering potential recontamination impacts.

    The reported Toxicity Equivalent Value (TEQ) of 0.316 milligrams per kilogram (mg/Kg)

is approximately 75% of the Preliminary Remediation Goal (PRG) of 0.423 mg/Kg. It is likely that a robust sensitivity analysis would show exceedances of the PRG. The results of such an analysis should be included in the report.

18. Page 36, Section 4.2, SEDCAM Modeling Results, Table 4-4: The column labeled "TEF" is not defined and its application as a divisor of the predicted equilibrium concentration should be described. The column "Bap Equivalent Concentration" is not defined nor is the basis for summing the concentrations.

19. Page 37, Section 5.0, Sensitivity Analysis: The sensitivity analyses relies on simple "halving" and "doubling" certain model inputs without consideration about whether these ranges are meaningful and representative of the uncertainties associated with the data sources. A meaningful sensitivity analysis should be conducted which assigns ranges based on quantitative assessments of the uncertainty associated with each parameter. Order-of-magnitude changes in parameters may be warranted if the uncertainty cannot be defined due to insufficient data.

20. Page 40, Section 5.0, Sensitivity Analysis: The report states that halving or doubling the sediment mixing layer does not affect the final equilibrium COI concentration. Figure 5-3 indicates that this does affect the final COI concentration. This appears to be a sensitive parameter and the sensitivity analyses should attempt to quantify impacts of a wider range of likely values.

21. Page 42, Section 5.0, Sensitivity Analysis: The report presents SEDCAM sensitivity results assuming that the sedimentation rate is halved or doubled. The report correctly notes that fixing the storm water sediment input while decreasing the overall sediment rate results in higher predicted future COI concentration. The report incorrectly suggests that, "*lowering sedimentation rates should also be accompanied by a lowering of the storm water COI mass flux,...*" There is no reason to presume that lower sedimentation inputs from upstream sources will be correlated to lower storm water sediment inputs. In order to be conservative, the screening level recontamination analysis should set a critical or design condition whereby the upstream inputs are much lower, while the storm water inputs are increased.

22. Page 44, Conclusions, 1st bullet: The conclusion that there is adequate storm water data to support the recontamination analysis is not supported by the data or analysis presented in the report. The normalization of COI data relies on regression analysis of as few as four storm water data points. This conclusion ignores the high level of uncertainty in the data. The screening level recontamination analysis does not provide "*sufficient information on average storm water conditions needed for the analyses.*"

23. Page 44, Conclusions, 2nd bullet: The conclusion that there is no potential for recontamination of sediments by arsenic should include sufficient caveats relative to the limitations of the current analysis and available data.

24. Page 44, Conclusions, 3rd bullet: The conclusion that there is no potential for recontamination of sediments by PAHs should include sufficient caveats relative to the limitations of the current analysis and available data.

25. Page 44, Conclusions, 4th bullet: The Wheeler Bay PAH results appear to be inconclusive at best and should be subjected to additional sensitivity analysis.

26. Page 44, Conclusions, last bullet: The sensitivity analysis performed included "halving" and "doubling" average COI concentrations from the river and storm water sources based on very sparse data and application of a steady-state model which assumes average conditions (e.g., river flows, river sediment, storm water runoff, and storm water water quality) do not change over a 30-year period. This conclusion should be deleted or appropriately caveated.